AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (previously presented): An apparatus for suppressing noise in an input image signal representing a radiographic image, comprising:

a smoothing unit which processes said input image signal by using a smoothing filter so as to smooth said radiographic image; and

a characteristic calculation unit which obtains at least one first characteristic of said input image signal by calculation using a function based on first information indicating an exposure dose with which said radiographic image has been produced;

said smoothing unit adapts at least one second characteristic of the smoothing filter to said input image signal based on said at least one first characteristic.

2. (original): An apparatus according to claim 1, further comprising a band-limited-image-signal generation unit which generates a plurality of band-limited image signals respectively representing a plurality of band-limited images belonging to a plurality of different frequency bands, based on said input image signal,

said smoothing unit processes said plurality of band-limited image signals by using said smoothing filter so as to smooth each of said plurality of band-limited images.

3. (original): An apparatus according to claim 2, wherein said band-limited-image-signal generation unit generates said plurality of band-limited image signals by performing multiresolution decomposition of said input image signal.

4. (original): An apparatus according to claim 2, wherein said characteristic calculation unit obtains said at least one first characteristic of said input image signal based on second information locally calculated from pixel values in a neighborhood of a pixel of interest in at least one of said plurality of band-limited images represented by at least one of said plurality of band-limited image signals, as well as said first information.

5. (original): An apparatus according to claim 4, wherein said characteristic calculation unit obtains a pixel vector at said pixel of interest in said at least one of said plurality of band-limited images, and detects an orientation of an edge as said second information, and

said smoothing unit arranges said at least one second characteristic of said smoothing filter so that said radiographic image is smoothed along said orientation of said edge.

6. (original): An apparatus according to claim 1, wherein said smoothing filter includes for each of a plurality of predetermined directions a plurality of filters respectively smoothing said radiographic image in said each of a plurality of predetermined directions to a plurality of different degrees, and

said smoothing unit adapts said at least one second characteristic of said smoothing filter to said input image signal by selecting one of said plurality of filters based on said at least one first characteristic of said input image signal.

7. (previously presented): A method for suppressing noise in an input image signal representing a radiographic image, said method comprising the steps of:

(a) obtaining at least one first characteristic of said input image signal by calculation using a function based on information indicating an exposure dose with which said radiographic image has been produced;

(b) adapting at least one second characteristic of a smoothing filter to said input image signal based on said at least one first characteristic; and

(c) processing said input image signal by using said smoothing filter so as to smooth said radiographic image.

8. (previously presented): A computer-readable storage medium storing a program which instructs a computer to execute a method for suppressing noise in an input image signal representing a radiographic image, said method comprising the steps of:

(a) obtaining at least one first characteristic of said input image signal by calculation using a function based on information indicating an exposure dose with which said radiographic image has been produced;

(b) adapting at least one second characteristic of a smoothing filter to said input image signal based on said at least one first characteristic; and

(c) processing said input image signal by using said smoothing filter so as to smooth said radiographic image.

9. (previously presented): A method for suppressing noise in an input image signal representing a radiographic image, said method comprising the steps of:

(a) generating a plurality of band-limited image signals respectively representing a plurality of band-limited images belonging to a plurality of different frequency bands, based on said input image signal;

(b) obtaining at least one first characteristic of said input image signal by calculation using a function based on information indicating an exposure dose with which said radiographic image has been produced;

(c) adapting at least one second characteristic of a smoothing filter to said input image signal based on said at least one first characteristic; and

(d) processing said plurality of band-limited image signals by using said smoothing filter so as to smooth each of said plurality of band-limited images.

10. (previously presented): A computer-readable storage medium storing a program which instructs a computer to execute a method for suppressing noise in an input image signal representing a radiographic image, said method comprising the steps of:

(a) generating a plurality of band-limited image signals respectively representing a plurality of band-limited images belonging to a plurality of different frequency bands, based on said input image signal;

(b) obtaining at least one first characteristic of said input image signal by calculation using a function based on information indicating an exposure dose with which said radiographic image has been produced;

(c) adapting at least one second characteristic of a smoothing filter to said input image signal based on said at least one first characteristic; and

(d) processing said plurality of band-limited image signals by using said smoothing filter so as to smooth each of said plurality of band-limited images.

11. (previously presented): An apparatus for suppressing noise in an input image signal representing a radiographic image, comprising:

a band-limited-image-signal generation unit which generates a plurality of band-limited image signals respectively representing a plurality of band-limited images belonging to a plurality of different frequency bands, based on said input image signal;

an index-value obtaining unit which obtains at least one index value indicating a degree of suppression of said noise, the at least one index value corresponding to a function based on information indicating an exposure dose with which said radiographic image has been produced; and

a noise suppression unit which processes each of said plurality of band-limited image signals so as to suppress noise in each of said plurality of band-limited images based on said at least one index value.

12. (original): An apparatus according to claim 11, wherein said index-value obtaining unit obtains said at least one index value indicating the degree of suppression of the noise for each of said plurality of band-limited image signals, and

said noise suppression unit processes each of said plurality of band-limited image signals so as to suppress the noise in each of said plurality of band-limited images based on said at least one index value obtained for said each of said plurality of band-limited image signals.

13. (original): An apparatus according to claim 11, wherein said index-value obtaining unit obtains said at least one index value indicating the degree of suppression of the noise for each pixel of each of said plurality of band-limited images, and

said noise suppression unit processes each of said plurality of band-limited image signals so as to suppress noise in said each pixel of each of said plurality of band-limited images based on said at least one index value obtained for said each pixel of said each of said plurality of band-limited images.

14. (previously presented): An apparatus for suppressing noise in an input image signal representing a radiographic image, comprising:

a band-limited-image-signal generation unit which generates a plurality of band-limited image signals respectively representing a plurality of band-limited images belonging to a plurality of different frequency bands, based on said input image signal;

an index-value obtaining unit which obtains at least one index value indicating a degree of suppression of said noise, based on information indicating an exposure dose with which said radiographic image has been produced; and

a noise suppression unit which processes each of said plurality of band-limited image signals so as to suppress noise in each of said plurality of band-limited images based on said at least one index value,

wherein said index-value obtaining unit obtains said at least one index value indicating the degree of suppression of the noise for each of said plurality of band-limited image signals,

wherein said noise suppression unit processes each of said plurality of band-limited image signals so as to suppress the noise in each of said plurality of band-limited images based on said at least one index value obtained for said each of said plurality of band-limited image signals, and

wherein said index-value obtaining unit obtains a first evaluation value from a first one of said plurality of band-limited image signals belonging to a first one of said plurality of different frequency bands and a second evaluation value from a second one of said plurality of band-limited image signals belonging to a second one of said plurality of different frequency bands which is lower than said first one of said plurality of different frequency bands, determines weights based on said information indicating the exposure dose with which the radiographic

image has been produced, for use in a weighted sum of said first and second evaluation values, obtains said weighted sum, and obtains based on said weighted sum said at least one index value indicating the degree of suppression of the noise for said first one of said plurality of band-limited image signals.

15. (original): An apparatus according to claim 14, wherein said index-value obtaining unit obtains each of said first and second evaluation values for each pixel of one of said plurality of band-limited images corresponding to said each of said first and second evaluation values, based on pixel values of said one of said plurality of band-limited images in a neighborhood of said each pixel.

16. (original): An apparatus according to claim 14, wherein said index-value obtaining unit obtains as each of said first and second evaluation values a pixel vector at each pixel of one of said plurality of band-limited images corresponding to said each of said first and second evaluation values, and obtains said at least one index value based on at least one of a length and an orientation of said pixel vector.

17. (original): An apparatus according to claim 16, wherein said index-value obtaining unit obtains as said at least one index value at least one of a degree of edge confidence, an amount of pixel energy, and a vector orientation.

18. (previously presented): An apparatus for suppressing noise in an input image signal representing a radiographic image, comprising:

a band-limited-image-signal generation unit which generates a plurality of band-limited image signals respectively representing a plurality of band-limited images belonging to a plurality of different frequency bands, based on said input image signal;

an index-value obtaining unit which obtains at least one index value indicating a degree of suppression of said noise, based on information indicating an exposure dose with which said radiographic image has been produced; and

a noise suppression unit which processes each of said plurality of band-limited image signals so as to suppress noise in each of said plurality of band-limited images based on said at least one index value,

wherein said noise suppression unit processes one of said plurality of band-limited image signals so as to generate a transformed image signal, and obtains a weighted sum of said one of said plurality of band-limited image signals and said transformed image signal by using weights determined based on said at least one index value.

19. (original): An apparatus according to claim 18, wherein said index-value obtaining unit obtains a pixel vector at each pixel of one of said plurality of band-limited images, and said noise suppression unit arranges an orientation-dependent filter based on a length and an orientation of said pixel vector, and obtains said transformed image signal by convolution of

pixel values in a neighborhood of said each pixel in said one of said plurality of band-limited images with said orientation-dependent filter.

20. (previously presented): A method for suppressing noise in an input image signal representing a radiographic image, said method comprising the steps of:

(a) generating a plurality of band-limited image signals respectively representing a plurality of band-limited images belonging to a plurality of different frequency bands, based on said input image signal;

(b) obtaining at least one index value indicating a degree of suppression of said noise, the at least one index value corresponding a function based on information indicating an exposure dose with which said radiographic image has been produced; and

(c) processing each of said plurality of band-limited image signals so as to suppress noise in each of said plurality of band-limited images based on said at least one index value.

21. (previously presented): A computer-readable storage medium storing a program which instructs a computer to execute a method for suppressing noise in an input image signal representing a radiographic image, said method comprising the steps of:

(a) generating a plurality of band-limited image signals respectively representing a plurality of band-limited images belonging to a plurality of different frequency bands, based on said input image signal;

(b) obtaining at least one index value indicating a degree of suppression of said noise, the at least one index value corresponding to a function based on information indicating an exposure dose with which said radiographic image has been produced; and

(c) processing each of said plurality of band-limited image signals so as to suppress noise in each of said plurality of band-limited images based on said at least one index value.

22. (currently amended): The apparatus of claim 1, wherein the first information represents at least one of a S value (indicating a reading sensitivity) and an L value (indicating latitude) of the radiographic image.

23. (currently amended): The method of claim 7, wherein the first information represents at least one of a S value (indicating a reading sensitivity) and an L value (indicating latitude) of the radiographic image.

24. (currently amended): The method of claim 9, wherein the first information represents at least one of a S value (indicating a reading sensitivity) and an L value (indicating latitude) of the radiographic image.

25. (currently amended): The apparatus of claim 11, wherein the first information represents at least one of a S value (indicating a reading sensitivity) and an L value (indicating latitude) of the radiographic image.

26. (currently amended): The method of claim 20, wherein the first information represents at least one of a S value (indicating a reading sensitivity) and an L value (indicating latitude) of the radiographic image.

27. (previously presented): The apparatus of claim 1, wherein the first information represents one of a selected menu item of an apparatus used to obtain the radiographic image, an age of a subject in the radiographic image and information from a photo-timer used to obtain the radiographic image.

28. (previously presented): The method of claim 7, wherein the first information represents one of a selected menu item of an apparatus used to obtain the radiographic image, an age of a subject in the radiographic image and information from a photo-timer used to obtain the radiographic image.

29. (previously presented): The method of claim 9, wherein the first information represents one of a selected menu item of an apparatus used to obtain the radiographic image, an age of a subject in the radiographic image and information from a photo-timer used to obtain the radiographic image.

30. (previously presented): The apparatus of claim 11, wherein the first information represents one of a selected menu item of an apparatus used to obtain the radiographic image, an age of a subject in the radiographic image and information from a photo-timer used to obtain the radiographic image.

31. (previously presented): The method of claim 20, wherein the first information represents one of a selected menu item of an apparatus used to obtain the radiographic image, an age of a subject in the radiographic image and information from a photo-timer used to obtain the radiographic image.

32. (currently amended): The apparatus of claim 22, wherein the function comprises:

$f(x) = 1.0$, when the S value < a first preset;

$f(x) = 0.0$, when the S value > a second preset; and

$f(x) = ([[a]]$ the first preset - the S value$)/([[a]]$ the first preset - $[[a]]$ the second preset), when the first preset ≤ the S value ≤ the second preset,

wherein x represents an X-ray dose and $f(x)$ is a function of the exposure dose x.

33. (currently amended): The method of claim 23, wherein the function comprises:

$f(x) = 1.0$, when the S value < a first preset;

$f(x) = 0.0$, when the S value > a second preset; and

f(x) = ([[a]] the first preset - the S value)/([[a]] the first preset - [[a]] the second preset),

when the first preset ≤ the S value ≤ the second preset,

wherein x represents an X-ray dose and f(x) is a function of the exposure dose x.

34. (currently amended): The method of claim 24, wherein the function comprises:

f(x) = 1.0, when the S value < a first preset;

f(x) = 0.0, when the S value > a second preset; and

f(x) = ([[a]] the first preset - the S value)/([[a]] the first preset - [[a]] the second preset),

when the first preset ≤ the S value ≤ the second preset,

wherein x represents an X-ray dose and f(x) is a function of the exposure dose x.

35. (currently amended): The apparatus of claim 25, wherein the function comprises:

f(x) = 1.0, when the S value < a first preset;

f(x) = 0.0, when the S value > a second preset; and

f(x) = ([[a]] the first preset - the S value)/([[a]] the first preset - [[a]] the second preset),

when the first preset ≤ the S value ≤ the second preset,

wherein x represents an X-ray dose and f(x) is a function of the exposure dose x.

36. (currently amended): The method of claim 26, wherein the function comprises:

f(x) = 1.0, when the S value < a first preset;

f(x) = 0.0, when the S value > a second preset; and

f(x) = ([[a]] the first preset - S)/([[a]] the first preset - [[a]] the second preset), when the first preset ≤ the S value ≤ the second preset,

wherein x represents an X-ray dose and f(x) is a function of the exposure dose x.

37. (previously presented): The apparatus of claim 1, wherein the function is defined by at least a signal value of a pixel and an amount of the exposure dose of the radiographic image.

38. (previously presented): The method of claim 7, wherein the function is defined by at least a signal value of a pixel and an amount of the exposure dose of the radiographic image.

39. (previously presented): The method of claim 9, wherein the function is defined by at least a signal value of a pixel and an amount of the exposure dose of the radiographic image.

40. (previously presented): The apparatus of claim 11, wherein the function is defined by at least a signal value of a pixel and an amount of the exposure dose of the radiographic image.

41. (previously presented): The method of claim 20, wherein the function is defined by at least a signal value of a pixel and an amount of the exposure dose of the radiographic image.